

Pacific Discovery



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IN THIS ISSUE: *Harold C. Bradley • Ira L. Wiggins*
Don Bleitz • M. Woodbridge Williams & Karl W. Kenyon
Borys Malkin

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Photograph by WILLIAM C. BRADLEY . . . Cover

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Pre-Discovery

The editorial phiz is fated to redden periodically—a penalty of belonging to so low an order ("necessary evils," one scientific author termed us). This phiz is the color of a ripe chili pepper, its wearer grateful to Reader W. V. Evans of Reedley College, California, for a correction:

"In Mr. Simpson's prejudiced article in your Nov.-Dec. 1949 issue, there is a glaring misspelling that you have gone so far as to repeat in a little drawing. The Spanish term for "detour" is "Desviacion" not "Desvisacion" as the article has it. In the many years that I have traveled in Mexico, I have found road signs no more often misspelled than in this country. . . . I traveled this road in a car this summer and found it excellent as far as Hermosillo."

If Don Simpson was "prejudiced" it must have been against whatever officials had failed, up to the time of his winter trip to Guaymas, to get bridges over the arroyos. Probably the signs were covered with dust going down, obscured by rain coming back. Moreover, Don's Spanish may be as sketchy as the editor's, who, in any case, takes full blame. His Spanish—what little is left—has an (aero)-nautical twist, having been acquired from a lieutenant commander of the Peruvian Navy. About all that stuck is *El avión vuela sobre el océano*, and the more advanced *¿Vuela el avión sobre el Océano Pacífico?*—never had anything about detours over dry washes.

This column is supposed to be about the next issue. When Dr. Harold C. Bryant, superintendent of Grand Canyon National Park, told Philip Ferry and his photographic fellow canyon climber, Al Schmitz, about Thunder River and its rumored falls, it was as good as a command to go there into the wild northwestern bounds of the Park—such is the pull of little-known places on this inquisitive pair.

The story of their first descent into Thunder Canyon ("Thundering Waters," *Natural History*, June 1949) told how Al lost all his Kodachromes and nearly his life when his horse fell on him in the rocky torrent. Philip Ferry wrote us: "Al Schmitz and Bob Cassel made a second trip to Thunder River in the fall of 1948. . . . They fought their way upstream and got the information set forth for

the first time in . . . 'Return to Thunder River'"—and Al got a magnificent new set of Kodachromes we wish could appear in color, next issue.

Discovering PD's Authors

Many readers of Harold C. Bradley's Conservation article, "Yosemite's Problem Road," will want forthwith to pursue the subject further. We refer them to "Roads in the National Parks," by our author and David R. Brower, *Sierra Club Bulletin*, June 1949. Professor emeritus of physiological chemistry in the University of Wisconsin, and now living in Berkeley a block from the campus which he left with the Class of 1900, Dr. Bradley is chairman of the subcommittee on roads of the Sierra Club's conservation committee, author of numerous articles.

Going "Beyond Cayambe," Ira L. Wiggins, who is professor of botany and director of Stanford University's Natural History Museum, draws again from his store of experiences as plant hunter in the Andes for our government.

Original prints of Don Bleitz' "Three Familiar Hawks" are currently on display in the Academy's Mineral Hall gallery. This bird photographer extraordinary does camera business on Hollywood Boulevard when not out in a blind on the side of a cliff or on a Salton Sea sand islet.

One of the real satisfactions of being an editor is getting to know some authors. Woody Williams, half the sometime crew of the *Seven Seas*, lives in near-by Inverness on Tomales Bay. The pleasure of meeting Karl Kenyon, down for the holidays this winter from the Fish and Wildlife Service in Seattle, was mixed with surprise at seeing a well-groomed young man-about-town—not in oilskins or just skin as in the picture on page 22 ("Treasures and Tricks of the Tide").

One of the real dissatisfactions of being an editor is having to cut good copy because an issue has just so many pages. "Doryline Dragnet" was chopped out of Borys Malkin's Cameroons story ("Clouds Over Cameroons," *PD* Nov.-Dec. 1949), but placed carefully on the hook for ready use. The author is back on the Pacific Coast after two years of study, travel, and collecting in Europe and Africa. D.G.K.

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RETREAT TO REALITIES

Nature knows good and evil,
 Joy and grief,
 But just and unjust
 Are beyond her brief.

True or false? Can Nature be so cruel as to be unmindful of justice? And if so would we have it otherwise?

As Mr. Average Citizen, or Joe Doaks, or the Forgotten Man reads his morning paper these days over a second cup of coffee he is apt to feel pretty depressed. The world of humans is out of joint. The Communists are sweeping Asia and thumbing their noses at us and we don't know what to do about it. Huge sums are being demanded to prepare the nation for a third and greater World War. Another big strike ties up the country's economy. In a land blest by Nature and of seeming abundance, more and more people are demanding subsidies and relief.

Mr. Citizen, pondering this array of disturbing news, will perhaps observe that all of these ills stem from, or at least have to do with, man's conception of what is just and what is unjust. And in searching for a definition of justice he could conceivably do worse than adopt that of Epicurus: "Justice is a contract of expediency entered into to prevent men harming or being harmed." The difficulties, of course, arise because each of us humans has his own ideas about when and how he is being harmed, or perhaps when and how he is not being sufficiently benefited, and loudly demands redress or more benefits from other humans who in fact haven't harmed him at all. All sorts of conflicts follow including World Wars and the evil aftermaths thereof.

These trials and tribulations affect us because the concept of justice is a concept of the not infallible human brain expressed in a contract of expediency. If this is so then Nature knows not "just and unjust," which, of course, was perfectly obvious all along.

But the real question is the desirability of this apparent void in otherwise omnipotent nature. Would it be better for mankind if Nature did hold just and unjust in her brief?

The ardent fisherman, consciously or unconsciously a lover of nature, finds relief and refreshment in whipping a lonely stream even in rough weather and with little success. He enjoys competition with nature, if not with his fellow man, because he and nature are on stern but equal and realistic terms, not confused by concepts of justice. The female osprey overhead is cruel when defending or providing for her young but it is a relief to know that she is not spending her time, except by example, in telling other birds how to

live. The fisherman can enjoy her beauty without vagrant doubts about the justice of her ways.

Why do many refined and educated people deliberately go and live for a time in the wilderness away, not only from the luxuries, but even from what we think are the necessities of a comfortable life? It is not merely to get material for an interesting book, though that were cause enough. They compete for existence against the keen blade of Nature almost as primitive man did. They find pleasure in doing so, and, I dare say, a great part of that pleasure is in being free to deal with their environment and its wild inhabitants without distressing doubts about the justice or injustice of the natural order. In the wilderness they can be satisfied with "good and evil, joy and grief."

During the half century just ended there has been an extraordinary growth of interest in all branches of science. Investigation and research in physics and chemistry have opened a new world for us, but this progress, brilliant and beneficial as it is when properly used, has also added to the complexities and problems of modern life, either real or imaginary.

There has been an equally great advance during these fifty years in man's appreciation of that branch of science commonly called Natural History. Last year, for instance, the eight-millionth student was enrolled in the Audubon Junior Clubs of the United States, an organization which had its inception only 39 years ago. And this is only one of the many associations whose objective is the study of wildlife, and its fellow traveler, the conservation of natural resources, which within a span of years less than an ordinary lifetime have been formed and expanded greatly not only in our own country but throughout much of the world.

In contrast to those studies which have given us the airplane and the atom bomb, the study of Natural History does not add to the complexities and problems of life. In a way it is an escape from them precisely because Nature is concerned only with facts and not with the controversial problem of justice. Perhaps this is why more and more people are finding contentment in contact with and in the study of Nature. It may be a retreat but it is a retreat to, and not from, the realities of this world. The idea of injustice, with which justice is necessarily contrasted, is painful and we have enough of it, of necessity, in the life into which we are born and which we cannot change.

"Nature knows good and evil, joy and grief, but just and unjust are beyond her brief"; and the present writer for one is very glad it is so.

M. E. L.

CONSERVATION

"Shall we enjoy the Tioga-Tenaya country as it is today, and hand it on to our children unspoiled, or shall we sacrifice it to traffic unlimited?"

HAROLD C. BRADLEY

Yosemite's Problem Road



Photographs by the Author unless otherwise credited

*Problem road?
An engineer's or
a motorist's dream
of perfection
this western leg
of the Tioga Road
is to many, but—
to others it is
an ugly slash across
the wilderness, and
it is not as safe
as it looks.*

BETWEEN TIOGA PASS AND LAKE TENAYA, including the Tuolumne Meadows, lies a high, cool, alpine region, not far from timber line. It is characterized by its lovely meadows, lakes, and streams, its massive domes graven by the glaciers, and its dramatic pinnacles of splintered granite which rose above the great ice sheet and now stand guard over the valleys. It is not a wilderness in the definition of the Forest Service, because a road runs through it. But it has managed to retain a great deal of its primitive charm because the road presents difficulties enough to check the casual visitor and prevent overpopulation.

In the early eighties a mining road was carved across what later was to become the park, from

the Big Oak Flat Road on the west to Tioga Pass and the mining operations at the crest of the range. Eventually it was joined by a road up Lee-vining Canyon from the Mono basin on the east. Thus for nearly seventy years there has been a cross-Sierra road—of sorts—traversing the region. The road was barely completed when the mining venture failed, and it was abandoned. It quickly lapsed into little more than a trail. Revived again when automobile traffic was admitted to the park, it functioned many years with only slight improvement. In the Master Plan of the early thirties, it was realigned as a modern highway. Sections on both the east and the west ends were completed before construction was halted by the war.



On the old mine road (this is on the "unimproved" 21 miles of the Tioga Road, near Porcupine Flat) the motorist is in the forest, not just whizzing through it. Annoying to speed demons, this part delights wilderness lovers, has a near-perfect safety record.

Approximately one third of the old mine road remains today, an interesting 21 miles of genuine mountain road, built entirely by hand—a souvenir of the exciting days of gold. It is narrow and winding. In some places it is rather steep, though its maximum grade of 18 per cent is routine in San Francisco and Berkeley. In some sections cars must pass on turn-outs. Curves are often sharp or blind. One must travel cautiously at speeds of from 15 to 20 miles an hour. Drivers, impressed with the apparent hazards of the road, make few mistakes. On its accident record it is one of the safest roads in the park. Paint is scratched now and then, or a fender bent. But serious damage or injury does not occur at 15 miles an hour. Dur-

ing the past ten years an average of two such minor accidents a year have been reported. Now and then a car gets stalled and holds up traffic. Time is lost, and tempers. Complaints accumulate at park headquarters. On the other hand many drivers enjoy the old mine road and appreciate its intimate charm. Since they seldom trouble to comment at headquarters there is general and justifiable agreement that something must be done to improve travel conditions on it. The only point at issue is, *How much?*

The 21-mile section has provided a moderate check on traffic. It does not exclude anyone who can drive a car. Thousands drive it every year. It does require attention, effort, time, and patience. Because of these demands it has served to screen out those who must have speed to be happy; those who are not sufficiently interested to invest the time and effort; those who require a house on wheels when they rough it; those who are timid, or incompetent and realize it. The check has been sufficient so that the high country has survived with little deterioration or loss of charm. Summer population has remained fairly stable and within the capacity of the region for recovery. In winter it reverts completely to sparkling wilderness. The public camps, the store, the gas and service station, the Lodge have remained primitive, small, and well concealed in the forests. The illusion of solitude and seclusion prevails even when there are hundreds of people present in the area. There is every reason to believe these fragile qualities will remain so long as the road continues to present some mild physical restraints on fast and effortless access. Those who require speed, tennis and golf, swimming tanks and dances, find them somewhere else.

If a broad highway is built the situation will inevitably change. The tide of population will rise. Crowding will begin and the developments which mass-man always manages to secure for himself will follow. The history of Yosemite Valley, where crowds today constitute the major problem, will begin to repeat itself in the Tioga country, and for the same reason—too easy access.

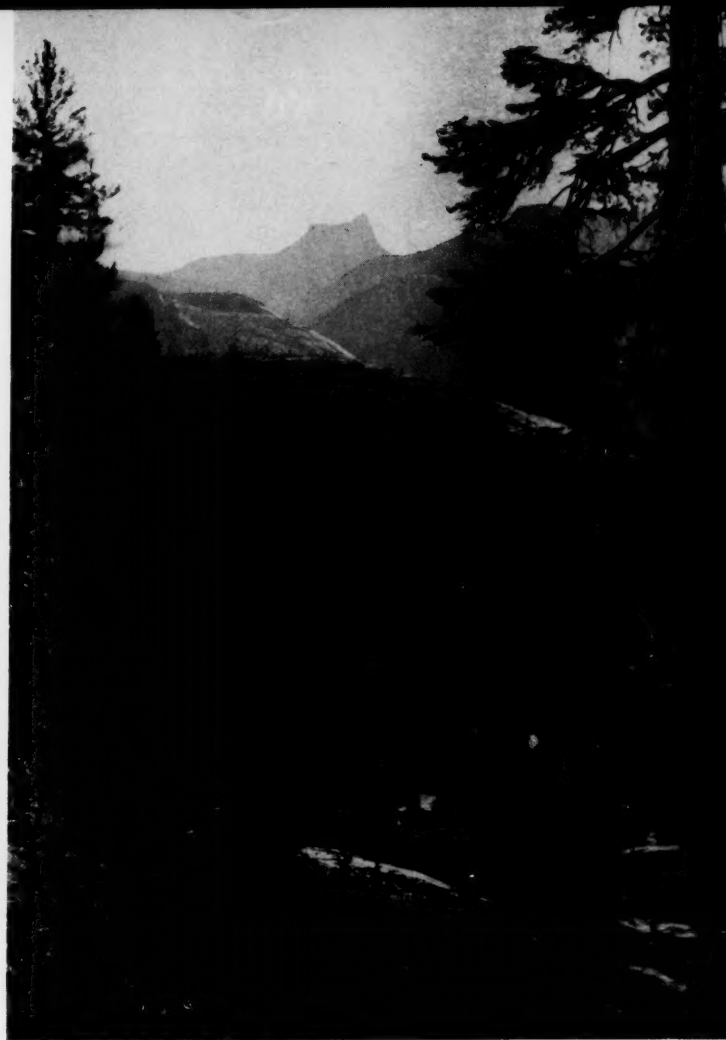
Three solutions, adequate for park traffic, present themselves:

1. *Complete the highway as planned.* This is in accord with the Master Plan and preferred by the National Park Service and the Bureau of Public Roads. It will be consistent in quality with the two sections already built. Its paved width will be

20 feet; its grades will not exceed 6 per cent; there will be straight tangents; curves will all be of long radius; visibility ahead will be extensive. It will be a high-gear highway, designed for effortless driving and speeds up to 65 miles an hour, which are current now on the completed sections. Its cost has been estimated at \$200,000 per mile. Its scars will be massive—as they are on the completed sections. Since it follows a new routing its scars will be in addition to those of the old mine road. It will cut a wide swath through the forest. Winter opening will be a matter of budget only. It will eventually crowd the upper country and initiate a new era of development there. It will form the crucial link in a fast trans-mountain traffic corridor for east-west travel.

2. *Widen and improve the present road for two-way traffic.* This can be done at a cost estimated at one-tenth that of the highway. Following the old route, it will produce only minor scars like those of the Big Oak Flat road which it will resemble. With an average paved width of 14 feet it will not open the forest canopy. Because rather narrow, winding, and sometimes steep, its traffic will move at about 20 to 25 miles an hour. It will for that reason be unattractive for transcontinental traffic. For the same reason it will tend to hold down population at the terminus, and long-range deterioration. Trailers will find it discouraging and commercial trucks impossible. Winter opening will be difficult.

3. *A double road with divided traffic.* The most interesting of the three possibilities is to widen and improve the present road for one-way traffic, build a second similar road roughly parallel to it, though often at some distance, and divide traffic into east- and west-bound. The new member of the double-road highway will, like the first, be narrow and winding, with variable grades, some of which may be moderately steep. Second and even low gear will occasionally be required. Speed will automatically be limited to 20 to 25 miles an hour. It will not be an invitation, therefore, to traffic unlimited. The speeder will prefer other roads. The house trailer will hesitate to take it. Commercial trucks will be excluded. Winter opening will be impracticable. It will present a decided block to the trans-continental traffic corridor through the park. Its cost will be greater than No. 2, but less than No. 1. It will produce a second set of scars, but like those of the present road they will be insignificant compared with those of the



The views of Yosemite high country one gets from the old mine road, such as this of Cathedral Peak looking across Tenaya Basin, are framed in trees and unspoiled by foreground of road-cut rubble and concrete—and slow speed makes for fuller enjoyment.

highway. The complete flexibility of its standards allows adjustments to the terrain crossed, with the minimum of disturbance. The highway, with its rigid standards, must necessarily blast the terrain into conformity with them. Because of this flexibility, too, the new member of the double road offers opportunity for imaginative and artistic treatment and emphasis on its functions of display. It offers the safest conditions for automobile traffic known, together with a sense of security and relaxation impossible where there is opposing traffic on the road.

In many places one-way roads have been found not only economical and practical, but highly appreciated by those who use them. In the Black



Safer?

This was early morning, the road was perfectly dry, the traffic light. The Generals Highway in Kings Canyon National Park is posted for the park limit of 35, the same as east and west sections of the Tioga Road, but, like it, is engineered for far greater speed. This driver was rounding the broad turn too fast, out of her lane, saw another car coming—tire marks tell the story.

Hills, for example, there are two such roads in constant use by tourists. Travel over them is considered an opportunity for unique driving enjoyment. Robert Casey describes driving over them in his recent book, *The Black Hills*, as an unforgettable experience, leading one "as far out of this world as you are ever likely to get with your eyes open." In Yosemite's Wawona Grove there is a stretch of one-way road which every tourist enjoys. As a display road, doing minimal damage to the scene and the Big Trees among which it winds, it is the perfect solution of the problem of how to present museum features of the park to visitors without at the same time initiating processes of deterioration. Such a treatment of the Tioga Road would appear to have everything in its favor—everything, that is, but speed.

If the 21-mile section is converted into a high-gear highway, we shall have set the stage for a fast transmontane corridor through our National Park, an alternate route to U.S. 6. In quality it will equal our northern highways 40 and 50, which now carry such heavy traffic loads. All other links are complete or scheduled for early completion. This presents the gravest sort of threat to the integrity of park values along its route. The first result will be to provide the traveling public with a direct, cool passage to the coast in summer, instead of the furnace heat of the Mojave Desert which now must be met. Cars bound west from Salt Lake City by way of Benton will certainly elect to cross

Tioga Pass to the Central Valley and the coast. For eastbound cars from anywhere south of Stockton, it offers a direct fast journey through pleasant surroundings, free from the heavy trucking traffic on 40 or 50. Even the traveler from the Los Angeles area, unless he plans to drive at night, will prefer the National Park route. Across the park then will flow a steady and increasing stream of fast-moving vehicles, intent only on reaching distant destinations. A trickle of that stream flows now across the old mine section. When that is improved, however moderately, that trickle is likely to increase. It will mount to flood proportions when we provide this wide open, effortless facility for east-west passage across the center of the range. Whatever the volume proves to be in a year or ten years, it will all be in addition to the volume of legitimate park traffic. It has no business in the park at all. Park officials deplore it—but see no way of stopping it. There is no way, short of stopping the highway.

To build a traffic corridor through the park is like providing a passage through the reading rooms and stacks of the Public Library, so that shoppers on First Street may get through to Second without the inconvenience of walking around the block. Opening the alpine country to unlimited traffic is like abolishing the QUIET sign at the Library entrance—posted or implicit, and enforced. What would happen were the Library thrown open, not only to those who come to use the books

speed.
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but to those who wish to gossip or practice the violin or work out a tap-dance routine, will happen also here. Those who now come to read the books will have to go elsewhere. The sight and sound of fast-moving cars will become continuous and incessant. Services will have to increase—food and overnight accommodations. Eventually a hotel will be required, more cabins, more service personnel, more recreational fixtures, more entertainment.

The demand for winter plowing and a ski resort will sooner or later develop. There are attractive possibilities for ski slopes, tows, a winter lodge.

In the event of an emergency, like war, or even just a touch of war hysteria, the highway will open for trucks. It is not conceivable that the Park Service can offer effective opposition to a facility demanded in the name of defense.

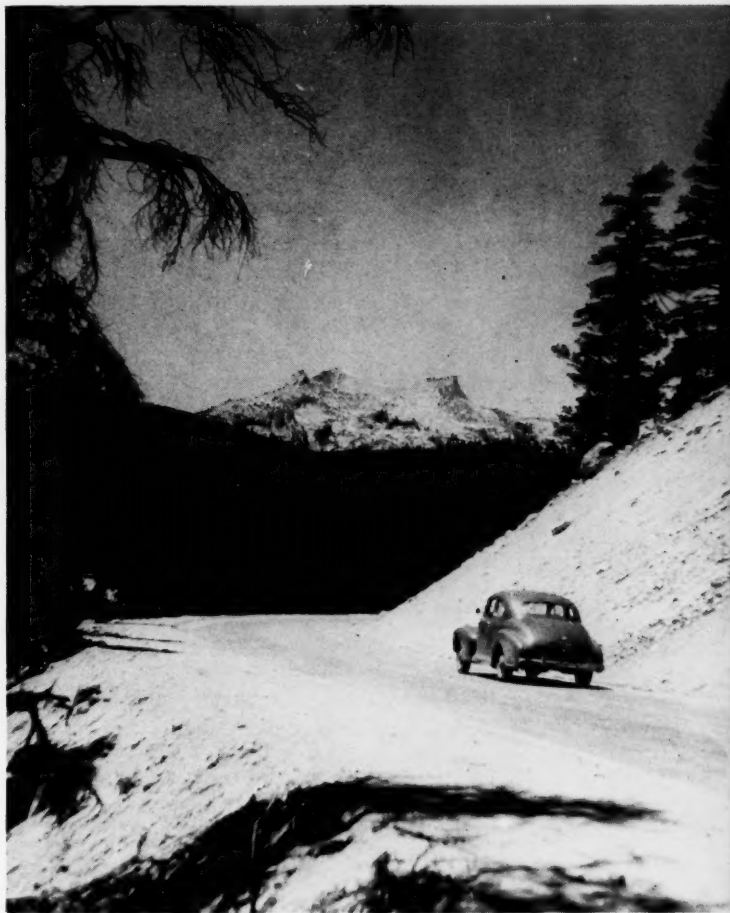
It has long been recognized that a through highway across the central Sierra will some day be required. There are a number of passes just outside park boundaries which are available. A road across one of them is reported to be already in the planning stage. When the need can justify the cost, it will be built. But if the Park Service now provides such a facility gratuitously and in advance of demonstrated need, the logical and expected solution will be postponed indefinitely.

Arguments pro and con. The problem of the Tioga Road has many facets. It involves a compromise, as all developments do in national parks. The exasperated driver demands a change. He probably would be glad to settle for a highway. The wilderness lover might prefer no road at all. Somewhere in between these extremes there may be found a solution which provides reasonable access and at the same time offers the possibility of preservation. A recent communication from the National Park Service states the situation so clearly that it gives us, and them, a criterion by which this and similar park problems may be tested:

Conservation of the area is the guiding principle in any planning or construction. A policy of conservation alone would preclude the construction of any facilities for the public. A policy which provided enjoyment of the area without regard to conservation would soon destroy or minimize those values for which the area was set aside. *A policy which will comply with both requirements, but leaning heavily upon conservation, now guides the Service in the construction of roads, trails and other facilities for the public.*

This is an excellent statement of park philos-

ophy. Conservationists will accept it without reservation. We frankly question whether 6 per cent grades, designed for speed and the sacrifice of park values that is required by providing a high-gear, transmontane traffic convenience through a national park, leans at all upon conservation.



With its natural frame of trees destroyed, this view is like a painting set upon a rubble heap. And despite proponents' claims of safety, surveys have shown that the most and the worst of Yosemite's auto accidents occur on the park's best developed roads. (Unicorn from Tioga Road between Tioga Pass and Tuolumne Meadows.)

Inquiries directed to our administrative agents have thus far provided us with more generalities, like the above, than specific answers to questions like: "Why must we be limited to 6 per cent grades in the mountains, when all cars are provided with gears?" "Why is a high-gear road considered a necessity?" "Why should a national park use its limited funds and sacrifice its intrinsic cap-

*Even in summer
Tuolumne Meadows may be
called semi-wilderness—
most of those who make
base camp here are careful
of nature and keep the
high country unspoiled.
A high-speed, through
highway would soon bring
motorized destruction.*



ital to provide a commercial traffic facility not required of it?" It is admitted that the highway is the most costly solution and does great damage to the scene. It is conceded that it will increase population, and so deterioration, in the high country. The trans-Sierran corridor is accepted as inevitable, as well as the changes which it will produce. It is stated that commercial traffic can be excluded by edict, and that edict can control speed (though speeds far in excess of the park maximum of 35 miles an hour are current on the completed sections). The 6 per cent grade is said to be demanded by the public—though only a trained engineer would be able to recognize a 6 per cent grade. It is said that since two-thirds of the highway has been completed to one set of standards it is inconceivable that the remaining third should not conform. Proponents of the highway object to the idea of building a road that will "exclude" anyone. The low standard road proposals have been characterized as "punitive" by some, as "snobbish" by others. The Park Service emphasizes the fact that there have been many complaints about the old mine section.

Exclusion is certainly the major weapon of the conservationist. He fights to exclude the tramway from Mt. San Jacinto, the lumbermen from the Olympic National Park, the lake-hopping airplane from the wilderness canoe country of the Quetico

Reserve. But in the case of the low-standard road for Tioga, there is no exclusion contemplated. If you consider the enjoyment worth the price of admission in terms of effort and time, you drive on up the low-standard road. If the effort seems to outweigh the probable enjoyment, you elect to drive somewhere else. This might be called voluntary screening—but hardly exclusion. It is certainly not punitive, nor is the library snobbish in demanding quiet so that readers may profit by its books. Whether we like the idea of voluntary screening or not, it is obviously operative—in reverse—now. The discriminating visitor to Yosemite Valley who likes a degree of freedom from distractions for his enjoyment of mountain scenery, elects to camp somewhere outside the Valley floor in summer. He locates perhaps at Tamarack Flat, or Bridal Veil camp ground instead. He finds himself "excluded" by the presence of massed humanity.

The argument that a long road must be of uniform character all the way, does not appear to us cogent. Anyone who drives our highways is quite accustomed to changes at least in functional character. He may be driving comfortably along at 65 miles an hour. A roadside sign appears and he drops to 35, then to 25 miles an hour. A red light marks an intersection and he comes to a dead stop. True—the physical character of the road may not

have changed, but its functional character has undergone a change as complete as though the road had been temporarily blasted out of existence. With adequate preparation and warning, the driver will accept a low-standard section of the Tioga Road without more than momentary annoyance.

As to the public demand for 6 per cent grades and high-gear highways, I wonder if that is anything more definite than an interpretation of the "many complaints." Colonel John R. White, writing from his background of 28 years of successful service as superintendent of the Sequoia and General Grant parks, makes this comment: "People are astonished at the magnificent highways we have built in the mountainous sections of the parks; rarely has there been any concerted demand for them."

Park roads determine park history. Yosemite Valley's major headache today is its overcrowding and the overdevelopment which goes with it. Of the many factors which contribute to overcrowding, the fast and effortless road of access holds the key position. It is the only factor which we can control. We may be prepared to accept the crowding of Yosemite Valley as something which it is too late to change. We may adjust our thinking to appreciate it as a magnificent urban park and recreation center. But we may well think twice before we open another unspoiled section of the park to a similar fate. If we believe the transcon-

tinental highway, cut through the park for travel convenience and unlimited volume, will best serve our present enjoyment while guaranteeing preservation of the area for our children, nothing at all need be done. Your silence will give consent. The irritated driver, acting on the impulse of the moment and asking only for reasonable access, has cast his ballot and it has been counted in favor of the highway. The chambers of commerce along the route, scenting increased tourist dollars, have added theirs. Few others have been heard from. Few indeed know that an election is being held. If you believe that a compromise will serve our present needs and offers firmer security for the Tioga country, your vote is desperately needed, now.

Time runs out. In a year or two, when the expected appropriations are available, the polls will close. As citizens, we are all owners of the parks. We pay all the bills. The administrative officers, the National Park Service, are our servants and responsive to our wishes. As the situation stands today only the expression of our wishes in the form of letters to the Secretary of the Interior, or the Director of the National Park Service, can change the final outcome. The proposition before us is: Shall we enjoy the Tioga-Tenaya country as it is today, and hand it on to our children unspoiled, or shall we sacrifice it to traffic unlimited?

Tioga's road is not Yosemite's problem. It is ours.

*—And even in winter
Tuolumne Meadows
would no longer be
sparkling wilderness
—untrampled
as it has been for
millenniums—and
every virgin slope
of the Tenaya country
would be hashmarked
by skis. There
would be nothing left
for those who are
content to come and
look upon beauty.
(William C. Bradley)*





The clouds draw aside at times to reveal Cayambe's snowpacked shoulders. Wheat fields creep far up the sides of the hills, replacing the natural grasses of the páramo.

IRA L. WIGGINS

BEYOND CAYAMBE

WHEN I ARRIVED IN ECUADOR on May 18, 1944, to join the field botanists searching for unexploited stands of quinine-producing *Cinchona* trees, I expected to go into the forest as soon as equipment could be assembled. But the director of the field crew working under the auspices of the Foreign Economic Administration ordered an acclimatization period in Quito before beginning the field work. The acclimatization process had barely reached the stage where I could walk a dozen blocks in Quito—a city built in a valley 9,300 feet above the sea—without stopping to rest, when plans were formulated for a trip into the poorly known *Oriente* east of Cayambe Peak. Dr. William B. Drew, now head of the Botany Depart-

ment at Michigan State College, and I were to spend three or four weeks in the rain forests of the Cayambe hinterland. We were to search for *Cinchona* trees rumored to be growing on the Amazonian side of the Andes in northeastern Ecuador. If we found such trees, and if the bark tested high in alkaloids, crews of bark strippers—*cascarilleros* to the Ecuadoreans—would set up camps and harvest the bark.

On May 27 we began preliminary talks with Antonio Valladares, a young Ecuadorean living at Olmedo, a village squatted at the foot of Cayambe's steeply sloping western shoulder. Antonio agreed to engage the necessary Indian carriers, machete men, saddle animals and pack mules. We

expected to be in the field by June 10, but on May 28 the revolution that ousted President Arroyo del Rio halted all preparations for the trip. When the short revolution was over, we were delayed again by the refusal of the Indians to leave Olmedo until the conclusion of a two-week-long fiesta. Finally, after much haggling and cajoling, we left Olmedo on July 10!

The delays and aggravating excuses were nearly forgotten when we rode eastward from Olmedo, Dr. Drew and I, on wiry little mules. Six pack animals laid back their ears in protest at the weight of the packs containing lentils, beans, potatoes, rice, parched corn, *máchiqua* (barley meal mixed with brown sugar), a few cans of corned beef, our personal gear and collecting equipment. Nearly every ounce of food to be consumed on the entire trip had to be carried with us, so sixteen carriers (*cargadores*) strung out ahead of us, ready to take over the packing job when the trail became too steep and muddy for the mules to negotiate it.

Olmedo is 10,300 feet above sea level, but as we looked up at majestic Cayambe towering an added 8,000 feet it was hard to realize that we were nearly two miles above the ocean's surface. The massive mountain dominated that section of Ecuador.

The trail led northeasterly past a wheat field being plowed for summer fallow. On the freshly turned soil were thousands of archeological objects. Potsherds, bits of carved stone, and occasional figurines of fascinating workmanship lay scattered across the field. Probably the lamentable sheet erosion that robs Ecuador of its soil had helped concentrate these trinkets which had accumulated during long periods prior to the coming of the conquistadors.

A little over a mile from the village the wheat field with its broken pottery was left behind and the trail started, reluctantly, it seemed, across the wind-swept páramo. We climbed steadily, catching a glimpse now and then of snow-cloaked Cayambe, but more frequently shrouded in chilling clouds or spattered by quick, sharp showers. When the trail reached 13,975 feet it seemed to despair of reaching the top of the ridge and fell away sharply around its shoulder to a small boggy bench. There we pitched our tents in a squishy carpet of sphagnum 12,750 feet above the sea and wondered who had invented the tall tales about the insufferable heat of the tropics! The wind blew a gale, water squirted out of the moss under foot

and the legs of our cots sank into the mucky soil until our sleeping bags nearly rested on the mud. We were tired, cold, and hungry. Firewood was scarce and damp. Our first night on Cayambe's frigid flank was something less than comfortable.

During the following two days the trail snaked uncertainly toward the northeast. We wound our way down into a canyon, climbed out, and floundered through the mud in which thousands of dwarf tree ferns grew so thickly that the *macheteros* chopped down several hundred to clear a trail for the mules—and used the six-foot-long trunks to build a corduroy road over the boggiest spots. We two botanists were nearly overwhelmed by the profusion of interesting plants. Nearly a score of species of orchids grew on and among the trunks of the ferns. Brilliant orange clusters of the tubular flowers of *Bomarea* were common. Epiphytic members of the blueberry family grew in the crotches of trees skirting the tree-fern bog. Parasitic mistletoes bore bright red flowers nearly eight inches long. Yellow gentians grew in the grassy spots that occurred here and there on the hillsides. Blackberry vines formed impenetrable thickets and produced berries of high quality. With such a wealth of plant life about, even the drizzling rain couldn't dampen our enthusiasm. Raindrops clinging to the filmy ferns danced with all the brilliance of fine diamonds when the sun broke through rifts in the clouds. At such times we almost forgot the cold wind and rain.

On July 12, at a fairly well drained meadow called Los Toldados, we reached the end of the trail as far as the pack animals were concerned. The trail from that point forward was too steep and boggy for the mules. The following day they would return to Olmedo with a couple of *arrieros*.

During the twenty days following the return of the mules we traveled only on our own feet—and met no other human beings. The men carried the supplies forward in relays, each man packing a load forward one day, returning to the previous camp after a night of rest, and bringing forward a second load before nightfall. The packing was exhausting work. My twenty-five-pound pack became dishearteningly heavy on the stiffer climbs, but it was a runt compared with those of the porters. Theirs often weighed seventy to eighty pounds. Yet the men carried those packs for as long as seven or eight hours per day with ten-minute rest stops each hour. Their stamina was astonishing.

There was little evidence of trail discernible to the unpracticed eyes of the two gringos, but our guide rarely hesitated. Two men continuously "cut pica," as clearing a trail is called in the Andes. This work called for supple wrists and hardened muscles—swinging a machete for three to five hours at a stretch is gruelling work. Nevertheless, the *peones* coveted the job, for it relieved the men selected as macheteros of their burdensome packs. We rotated the machete work among the members of the crew so no one of them would have to carry more than his share of the heavy loads.

We keenly enjoyed the opportunity of observing and working with those Quechuan Indians. Some of them were nearly pure Indian. Others were of mixed blood. One of our men was a picturesque old ruffian, whose real name we never learned, but whom the men called "Chivo," or "Goat." Chivo reminded us of a satyr. His trousers were made of undressed cowhide, with the bottoms of the legs barely reaching his knees. One of the more timorous *peones* told us, confidentially, that Chivo was "*un hombre muy malo*" who might behead us with his machete if we gave him a disagreeable assignment. But we got along famously with Chivo, mainly, I suspect, because we didn't get angry when he laughed at our clumsiness. He thought it a huge joke when Dr. Drew fell into an ice-cold creek, and when I tripped over a liana, as I scram-

bled out of the way of a falling tree, and butted a vine-covered stump a resounding thwack with my head. Nor did he object when others laughed at him when he broke through the thin sod covering slimy mud and had to be helped out with our walking staves.

One of our best-natured and most faithful aides was Romo, who seemed at times to be totally lacking a sense of humor, but who often threw us into stitches with naïve remarks that seemed no more than an expression of simple logic to him. Once, as we slogged across a boggy páramo we saw scores of plump earthworms crawling over the water-logged soil. After asking him the Quechuan name for the worms I said, "Romo, it seems strange that there are so many earthworms here on the cold páramo. What are they good for, anyway?"

Romo needed no anthropocentric reason for their existence. Without a second's hesitation he answered, "For the birds to eat, *Patroncito!* A child knows that!"

Again the laugh was on the gringo and the Indians enjoyed it immensely. Various incidents helped keep the men in good spirits, for to a jungle-wise Quechuan the gringos frequently did uproariously funny things. They were hugely amused when Dr. Drew and I had slight appetite for a rabbit cooked in boiling water—without its





first being skinned or eviscerated. Rabbits cooked in that manner, they said, had "many more *vita-mines*" than did those cooked *after* dressing!

We had elected July to penetrate the Oriente because the dry season was supposed to be well under way by that time. But the "dry" season on the east flank of Cayambe that year saw a steady drizzle almost every day and many of the nights. Once in a while a biting wind would tear the clouds to tatters so the sun shone through to the dripping forest. On one such occasion we were camped at an elevation of 11,450 feet almost due east of Cayambe. Rain had fallen steadily until 4:30 in the afternoon. At five, the clouds hiding the peak parted and the majestic height of the mountain stood resplendent in a dazzling new mantle of snow. Its beauty was breath-taking.

And so was the piercing wind! Never before had I known how frightfully cold it could be when one stood on an exposed ridge two miles above the sea almost smack on the Equator! It was hard to realize that Guayaquil, only a few minutes flight by DC-3 from the spot where we stood, never knew frost and that bananas, cherimoyas, mangoes, papayas, and coconuts grew lushly about the city.

Days passed and none of our *recordas* located any exploitable *Cinchona*. We pushed from camp to camp until during the quiet of the night we could hear the distant boom of the volcano, El Reventador. Antonio said it was still five days march to the foot of the mountain—a distance of about forty miles. We didn't want to return without finding bark so pushed through the rain forest that stretched a thousand miles and more to the east. But Cayambe still dominated the western skyline.

At length, our food supplies running low, our blankets and clothing soggy, our boots waterlogged, our further progress was blocked by the Río San Pedro. The unseasonable rains had held it at flood stage long beyond the normal period of high water, so it was far too wide to be bridged by the tallest trees we could find growing along its steeply sloping bank.

Disappointed as we were by our failure to find new sources of bark, retracing our steps was much easier than the outward trek had been. On the back-trail all our picas were already open. We used the same campsites cleared on the outward trip. We felt as though Cayambe had outwitted

Laguna San Marcos receives the waters from Cayambe's melting snow, then hurries them on toward the Amazon. Hot springs bubble through the sandy flat in the middle foreground.

Three Familiar Hawks

us. The mountain occupied more and more of our thoughts and was a frequent subject of conversation. Our Indians were apprehensive during the two days that we climbed through the pass and around the jostling shoulder of the peak, where we toiled to an elevation of 14,300 feet to work our way around the head of a deep, rock-walled gorge. The men's uneasiness was accentuated by the knowledge that a Negro attached to a similar party in May had been caught in a snowstorm on that same austere shoulder and frozen to death.

We spent two days at Laguna San Marcos, vainly trying to dry our gear while waiting for a runner to push on to Olmedo and return with the pack animals. Boulder-strewn bajadas approached the lake from the higher ridges of Cayambe, and streams milky with the flour-like scourings of the glaciers poured their floods into its cold depths. Although the water in the lake was bitterly cold, water too hot for comfortable bathing bubbled to the surface on a sandy flat near the northeasterly outlet. A stream from Cayambe's roof flowed across a portion of the sand flat, and less than 200 yards from its mouth a creek that eventually added its bit to the mighty Amazon flowed out of Laguna San Marcos. The oppositely flowing streams were separated by a low ridge of glacially polished boulders.

I was unable to verify the report that Laguna San Marcos had two outlets, the one we saw which led to the Atlantic, and another at the westerly end of the lake which flowed into the Pacific.

The pack animals arrived at Laguna San Marcos late one afternoon and the next morning when the sun broke through the clouds we were making good time across the páramo on the last day's march back to Olmedo. We were still traversing one of the broader, less precipitous flanks of majestic Cayambe, but we no longer felt as though chained to the peak. It had dominated the landscape throughout the trip. We had scanned its slopes and crags on its westerly, northerly and easterly flanks. It had been awe-inspiring and a bit forbidding as we approached it from Olmedo. It was still magnificent as we returned to that unpretentious little Indian village. Rumors there still were that *somewhere* "the other side" of Cayambe stood rich *manchas* of *cascarilla*. But Cayambe had kept her secret. If such stands of *Cinchona* trees exist, their exact location is still unknown. They are still "Beyond Cayambe."

Peregrine Falcon or Duck Hawk, *Falco peregrinus* (PAGE 15).

One of the fastest-flying birds in the world (fastest of all: the cloud swift of the West Indies) is the peregrine falcon. Certainly it is a spectacular bird—I never cease to marvel at its beautiful ease of flight.

Of all birds of prey, none is more universally distributed over the world nor so well adapted for training as this falcon. For these reasons it has been the favorite of falconers who have trained it to hunt since ancient times—the Egyptians trained falcons in the days of the Pharaohs. Falconry is practiced today largely by a few who follow the sport through sheer love for the birds themselves rather than through interest in hunting.

The photograph was made from a blind constructed on the face of a cliff near Los Angeles, California. I went down a rope to the blind, which was built on a ledge about 8 inches wide and 30 inches long. My position was rather cramped as I hung on to the rope with one hand and operated the camera with the other. I got several Ektachromes of the male returning to the nest, and then a couple of black-and-whites, of which this was one. The exposure was 1/1000 of a second at f.11 on Super Panchro press type "B" film, with a 12" Ektar lens; developing was with Pyro Acetone, by inspection.

Red-tailed Hawk, *Buteo borealis* (PAGE 16).

Our commonest Buteo or buzzard hawk, this ranges in one race or another over most of the United States. A beautiful flyer, it soars on the wind currents like a vulture. Red-tailed hawks feed chiefly on rodents, in California preying largely on ground squirrels. They hunt by soaring over the terrain and following its contour until they surprise a ground squirrel that has ventured away from its burrow.

There are many color phases among these hawks. In the spring of 1949 I was shown the nest of an almost pure black individual near Santa Ana, California. They usually nest in tall trees and on



ledges of cliffs, laying two or very rarely three eggs. The average height from the ground of 33 nests I examined was 56 feet. In the Southwest's deserts, however, they often nest in cactus or in Joshua trees within 20 feet of the ground.

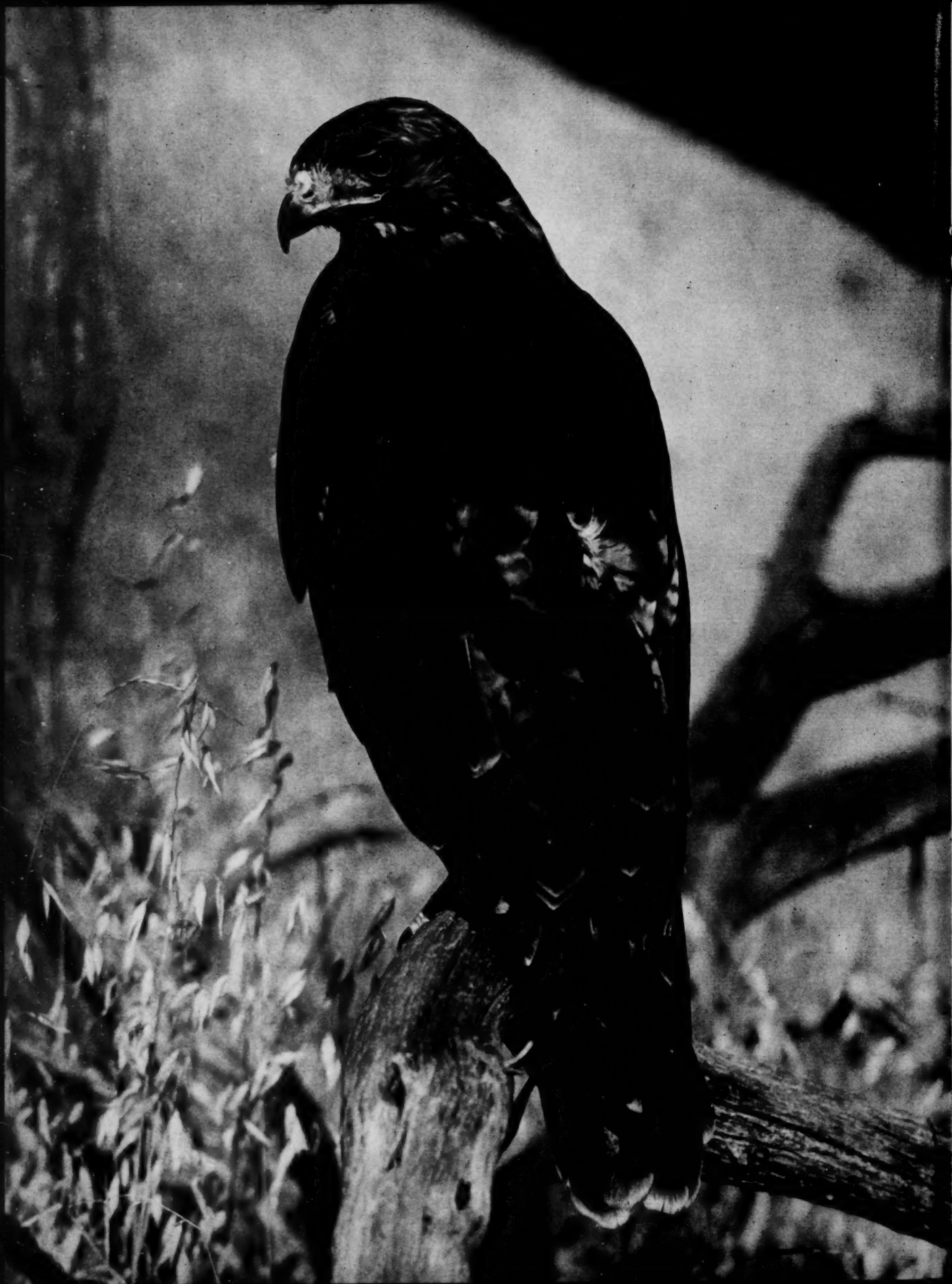
This shot of a fully adult male was made in the hills behind Fillmore, California. Exposure 1/50 sec. f.8 on Ektachrome Daylite with one fill in No. 2B; Monochrome on Super Pan "B"; Pyro Acetone Developer, by inspection.

Red-bellied Hawk, *Buteo lineatus elegans*
(PAGE 17).

The western counterpart of the red-shouldered

hawk of the East, this is essentially a bird of low-land forests and river bottoms. Often associated with cottonwoods, willows, and oaks, this hawk usually hunts by perching on a low snag or dead branch — when something edible appears (anything from insects, crayfish, and frogs to small snakes, lizards, and rodents), it darts down swiftly and captures its food. It nests in many different situations, but usually in thick groves of cottonwoods, sycamores, or willows. The nests are 30 to 70 feet above ground, commonly over 50 feet.

The shot was on Ektachrome Daylite—2 No. 2B Flash at 5 feet away—1/50 sec. f.11, with an 8" Ektar lens; Los Angeles County, California.





"Seven Seas" to Cedros, Part 2

Treasures and Tricks of the Tide

M. WOODBRIDGE WILLIAMS & KARL W. KENYON

SAN GERONIMO IS A BARREN SANDSTONE ROCK about three-quarters of a mile in length. We found it in a dense fog when we heard the breakers crashing on its treacherous shore. Fortunately we were able to come about in time to avert disaster, and felt our way to the island's lee, using a sounding line and listening to the muffled thunder of waves on rocks. Through drifting billows of mist a cluster of shacks appeared on shore, staring at us through vacant windows. We paddled ashore to what seemed to be a ghost camp. Apparently fishermen had once lived there—stacks of lobster traps rested near the buildings and rows of giant bass heads, a foot long, grinned from the cobble beach.

Behind the deserted camp, lizards scampered for shelter among the hundreds of Cassin auklet burrows that honeycombed the soft areas of the island. Pelicans and cormorants nested there too, and several pairs of oyster catchers filled the misty air with piercing whistle-like cries. On the hill back of the shacks we found three yellow crosses dated November 1945.

Woody was immediately absorbed in an orgy

of collecting. Just before dark he finally emerged dripping from a tide pool. His pockets and knapsack bulged with specimens, and a look of ecstatic joy lighted his face as he exclaimed, "This is the richest tidal zone I've ever seen!"

The first part of this narrative of exploration on the west coast of Baja California by two sea-going biologists appeared in *Pacific Discovery*, September-October 1949, copies of which are available. The third and last part will appear in an early issue.—EDITOR.

On the east side of the island were deep tide pools in a rock ledge which were fed from the sea by passages through fissures in the rock. The walls of these pools were honeycombed with the excavations of purple sea urchins which formed a background for the red and orange plumes of sea cucumbers, and the bright feathery umbrellas of marine worms. An octopus amid coils of brown-

Only a ghost camp
welcomed us
to the lonely shore
of San Geronimo.





PHOTOGRAPHS BY THE AUTHORS

The national emblem of several countries is suggested by this Brandt's cormorant in full flight above the water, San Geronimo.

spotched tentacles eyed the collector from its hole in the tide pool. Nut brown cowries clung to the cavities formed by the sea urchins.

Wet from head to foot, the collector seemed unconscious of the chilly sea and wind-drifted fog

ican fishing boats put in and anchored near us, and part of the crew went ashore. Before we had prepared breakfast their skiff moved toward us from the beach. As they neared, Karl asked them what they had found there. "Many eggs for break-

San Geronimo Island is a small, windswept spot of land surrounded by kelp beds and protruding reefs.

The cross is probably that of a fisherman; several more recent crosses marked burials made during the war.



that enveloped us. All the way back to the *Seven Seas* Woody sat in the stern of the dinghy fondling his treasures, and since Science comes first in such situations, the kettles on the cook stove soon simmered with specimens.

With darkness the atmosphere about us burst into life. The auklets and murrelets, which fly to and from their burrows only under cover of darkness, were abroad. Their musical twitterings told of their passing, although we could seldom see them. Attracted by our lighted portholes, *Xanthus* murrelets frequently landed on deck and scampered about, exploring the folds of the sails and spaces under our lashed-down luggage. Apparently they were poor of sight—Karl found that by approaching quietly he was able to snap several photo-flash shots of them.

At dawn the following morning a pair of Mex-

fast!" was their happy reply, and they came alongside to find out where we were from and where we were going. They had a five-gallon can full of cormorant eggs, so Karl asked them if they were very good. Their reply was affirmative, and with the typical generosity of Mexican fishermen they handed up a dozen or more.

Woody was again absorbed in his specimens and had them spread over our small table, so Karl decided to prepare breakfast. The cormorant eggs had come just at the right time. As he cracked them into the skillet he discovered that the egg gatherers had arrived several days or more too late. The young cormorants were fairly well formed. Since he had started, however, he decided to finish the job and scramble the whole batch. Woody refused to leave his specimens, so Karl placed his breakfast among them while he

absent-mindedly reached for the fork Karl held out to him. Sorting shells with one hand, he proceeded to dig into his breakfast with the other. Unable to get his courage up to try the scrambled concoction, Karl watched to see Woody's reaction. With hardly a glance at his plate Woody plowed right through the stuff. Karl tried one mouthful but gagged and left hastily for topside. When Karl returned below, Woody held up his empty dish and casually requested more. Karl felt that now he had witnessed a collector's zeal carried to the pinnacle of perfection.

Two days of pleasant sailing weather revealed the desolate barrenness of the waterless coast of Baja California near which we passed. Beyond crumbling cliffs and broken rocky shores stretched vistas of parched ground. Even small bushes and cactus were widely scattered.

Now after a short stay beneath the towering cliffs and bluffs of San Carlos anchorage, and off a deserted pismo clam camp at Santa Rosalia, we lay in the lee of Lagoon Head at Santo Domingo Landing, ready to make a try at crossing the bar into Scammon Lagoon—into a region famous for its bird life, which Karl had set his heart on seeing.



We lay at the northern end of the lagoon region which has been formed where a wide bight in the coast, called Sebastian Vizcaino Bay, invades a lifeless waste of desert to form three lagoons—Manuela, off which we were now anchored; Black Warrior, whose outline is still indefinitely indicated by dotted lines on present-day charts; and Scammon, largest and most southern of the three. Point San Eugenio with its stone lighthouse marks the southern limits of the bay; and the outer periphery is bounded by lofty Cedros Island, whose peaks, on a clear day, can be seen from the mainland across sixty miles of water.

The area takes its name from the Spanish explorer Vizcaino who first dropped anchor there in 1602. He had been sent out under the orders of Philip II of Spain to "stop the abuses of the English sea rover Drake and to populate and fortify California ports," in an area which Drake had claimed and called "New Albion."

The second day of our stay at Lagoon Head we tried to make a run for Scammon Lagoon thirty miles to the south, but the seas increased in size beneath a leaden sky. Despite his eagerness to reach the area, Karl deemed it wiser to wait till the seas had quieted and there was not so much danger of being caught and churned to bits on the hazardous bar. Such was the fate of the whaler *Black Warrior*, whose captain mistook the entrance of the lagoon that bears the ship's name for that of Scammon Lagoon. The ill-starred ship was doomed in a turmoil of crashing waters where the great Pacific swells often sweep in from the open sea to pound on the offshore bars. We came about and returned to the anchorage.

We had company for a time under the lofty Head. She was the shark boat *Federal* of San Francisco, and had been laying nets for soupfin outside the bay. Luck had been poor, and the boat was to be sold upon her return to San Diego. This we learned when her people invited us over for dinner. It was the first meal in twenty days that we could sit down to and enjoy. We feasted on fresh halibut, milk, and piles of roasted potatoes. At the end of the table was Bill Murphy, plump, with spectacles and a studious air. He was well spoken, did most of the talking, and seemed to know a good deal about the coast. Slim, next to him, didn't say much, just sat and listened, while Swede, an Alaskan veteran, swore that he'd take San Francisco and all its fog any day before this God-forsaken coast. Then of course there was

Woody Williams dives happily into a tide pool for invertebrate treasure on San Geronimo's reef.

BELOW: *Baby harbor seal flippers out of his tidal swimmin' hole in the reef of San Geronimo, and RIGHT—tries to make himself scarce by blending with the cobblestones on the beach.*



pasty-faced Cookie—a good one as we could testify. A bald-headed fellow in long johns and suspenders completed the company.

They gave us an armful of provisions, including coffee of which we were running short. Karl had never been much of a coffee drinker until this trip, but he was easy to convert to the vice, after a cold day ashore or a wet trick at the tiller. The cook also showed us a large turban snail which had been hauled up in the shark net. We suggested he boil it and remove the animal if he wanted to keep the treasure without driving the rest of the crew out of their quarters.

With the departure of the *Federal*, we passed time by clambering about the steep cliffs of the Head where we found a small kitchen midden in front of a cave, perhaps laid down before Spain had ever known this desert land. Down the black volcanic cliffs, above the restless sea, parasitic jaegers were diving upon a royal tern, in attempts to plunder the fish which it had plucked from the sea.

Where Lagoon Head (Santo Domingo Point) joins the land, the topography levels off toward the tidal flats of Manuela Lagoon. As we surmounted the crest of the dunes back of the beach

and gazed over the estuary, we were almost blinded by the brilliant green of the salt marsh vegetation. Our eyes had become accustomed to the somber hues of the desert coast.

Just back of the beach we found a deserted shack made from yucca stalks, and near-by old nets and a skiff were drawn up on the beach. A box-like launch rested at anchor in the lagoon, apparently in good condition. There were no signs of men about, only coyote tracks in the dunes, and car ruts that wound off leisurely into the interior from behind the shack. Over the marshes flocks of western and red-backed sandpipers rapidly wheeled in perfect unison.

Here there were no individuals. The flock became as one, every member acting instantly in the same manner. As the flock turned quickly in a graceful arc on its side its light underbelly shone brightly against the gray sky. Another quick turn and flick to its other side, and the flock would disappear, its mottled back blending perfectly with the terrain. There were no lonely sandpipers here at Manuela, but joyous flocks, similar in flight to schools of fish flashing concordantly through the sea.

It was at such times as these that we would feel in accord with the wild things about us, as if we had always lived there, had been born there, were as much a part of this primitive land as the sandpipers and coyotes. Still, at evening Woody, for one, would feel the deep pangs of homesickness, the longing for home and family, the tie that binds a man to civilization. Karl, though, was still a



"See the birdie!"

Karl Kenyon does a portrait job on a murrelet dug from its burrow on San Geronimo Island. Parts of the coastal islands were honeycombed with the burrows the parent murrelets make to rear their young in.
In circle, RIGHT—closeup of the young murrelet.

bachelor. Birds and untamed lands remained his first love. All the guy needed for perfect peace was a gun, a fishing pole, a camera, a bird blind, his stogies, and a little piece of land whose only inhabitants were screaming and chattering sea birds.

The day we entered Scammon Lagoon was no different from many before. Beneath leaden skies ominous swells piled up higher and higher as they swept into the shallows of the coast. Our tiny sloop seemed little better than a piece of flotsam as we observed the long lines of white water across the entrance to Black Warrior Lagoon.

As we neared Scammon farther to the south we caught the tide approaching maximum height. On our seaward side were breakers, and to landward of the narrow channel down which we moved parallel to the coast waves broke on the beach. At times all we could see before us was white water, but between sets of breakers we thought we could pick out a passage hilly with steep-sided swells. Sand dunes on the barren coast moved by us much faster than the speed of our engine alone would have allowed. The tide was sweeping us into the boiling pot whether we liked it or not.

We put on life jackets and made handy an emergency kit with water and rations. Karl speeded up our one-lunger Wisconsin to its capacity, and we headed into the lagoon as the entrance quieted a bit between sets of heavy swells. Then for a moment the chances of our return to San Diego became extremely thin. A green comber bore down on us, developing an ugly curl as it approached. We turned the bow of the tiny sloop into it, and held tight. Up and over she went like a cork. The wall of green water crashed a hundred feet astern. We were in!

"You can cut down the engine now, Woody," Karl said from the bow. The helmsman gave the cockpit throttle such a sock it took Karl half a day to repair the damage.

Suddenly we heard a hollow echoing wheeze astern. It was as if some subterranean cavern had unexpectedly emitted a great volume of gas. We snapped around to see two forty-foot hulks spotted with brown, gray, and dirty yellow break the surface behind us, blow columns of vapor into the air, and after a short spell of rolling along the surface, casually sink beneath the lagoon. The absence of a dorsal fin led Karl to shout "California grays!" Just then one cetacean rose upright in the water, poised for an instant on its flukes, then fell back into the lagoon with a mighty splash.

"Look at 'em broach, Karl!" Woody cried. We



did not molest our escorts. They were twice the size of the *Seven Seas*. But finding them here was an interesting discovery because for a good many years the California gray whale was considered practically extinct.

In the seventies whalers almost exterminated these animals. Often during the 1850's the lagoon had rung with the clang of coopers' hammers, making casks for whale oil, and often too the screams and curses of the hunters sounded in despair as one of the wounded "devilfish" splintered a whaleboat with its powerful flukes. The hunters found the lagoon "alive with whales, porpoises and fish. Turtles and seals basked on the shores of the low islands studding the lagoon, and small game was so abundant that acres of sand bars bared by the tide were closely packed with wild geese, duck, snipe, and other waterfowl."

The slaughter of the gray whale began in the winters of 1846 and 1848 when their abundance in the lagoons of Baja California first became known. In the last-named winter fifty-two whaling ships anchored to the south of Scammon Lagoon in the great sheltered bay of Magdalena.

Captain Charles Melville Scammon, who first entered the lagoon in 1858, predicted the extinction of the gray whale in his classic work on *The Marine Mammals of the Northwest Coast of North America*, published in 1874. His predictions almost came true. Naturalists for twenty years never



Rare photo of a Xanthus murrelet that flew on deck at night while the sloop was anchored off San Geronimo. These shy birds breed in burrows on the island and fly only at night.

saw a gray, until Roy Chapman Andrews found specimens at a Korean whaling station in 1911.

Toward the end of the 19th century, the invention of the harpoon gun increased the slaughter of whales and added to the safety of boat crews. The gray whale was particularly vulnerable to attack as the females congregated in the shallow lagoons along the Baja California coast to breed in the early spring. There they gave birth to a single calf each, rarely twins, while, according to Captain Scammon, the males remained offshore outside the lagoons.

Following the birth of the young, the gray whales migrated northward to the Arctic and again returned to the lagoons the next spring. In 1854 a thousand whales were estimated to have passed down the coast in a single day during the



Weird yuccas dominate the sand dunes around Santa Rosalia Bay.

migrating season. In 1874, Captain Scammon counted no more than forty. Today the species seems to be slowly recovering in numbers and returning to its former breeding grounds which for many years have been free of whaling ships.

Captain Scammon reported that little was known of the feeding habits of the California gray whale. Whales killed in the lagoons sometimes contained varying amounts of marine algae in their stomachs, but this was probably not taken in *as* food but *with* food.

The lagoon seemed deep and endless. Shore was indistinct in the mists through which the rolling sand dunes appeared as ghosts of former mountain ranges.

Before a brisk northwest breeze the trim sloop skipped up the bay. We began to relax, cast discretion to the wind, and stowed our life jackets below, although we knew that the lagoon was uncharted. When we came up to the first island, the extensive shallows around it should have suggest-

ed to us that the *Seven Seas* with her four and one-half-foot draft was not meant for navigation in this lagoon. The island was covered with nesting cormorants, gulls, and reddish egrets, all of which appeared to be standing on water, until we were almost up to them and the low island took shape. Karl wanted to land, but a quick glance over the side told us to come about quickly if we didn't wish to go aground. We tacked out again into deeper water and headed on up the bay. The zest of exploration was upon us—Williams, Kenyon, and Admiral Byrd.

Dead ahead was some kind of habitation. It looked like a mirage, apparently suspended in air a short distance above the water. Still, we decided to investigate. As we ran up closer we were sure of its being a crude habitation—an island had formed beneath it. We surmised the shanty to be deserted like many of the makeshift dwellings which mark the only signs of man along this desert coast.

We rounded the point of the island with jib and mainsail set, and ran before the wind directly for the shack. Then we struck, and hit again. In the few split seconds that it took for us to grasp the situation, the sloop, running free, drove well up onto the sand. Admiral Byrd was again alone in the explorers' hall of fame.

Woody pushed the tiller hard over, but she only came around to careen broadside to wind and sea, her canvas flapping dismally in our faces. With the one-lunger at full throttle, sand and water churning, we tried to break her loose. While Karl tended the engine, Woody climbed overside into the waist-deep water and heaved on the bow, but every chop, kicked up by a nasty cold wind, set the craft higher on the strand. Williams would have been as useful in his bunk. We were licked until flood tide, and we knew it.

"Hey, look!" Karl shouted. He pointed toward the island whose existence we had totally forgotten in the struggle to free our craft. Putting out from shore was some sort of small boat. It seemed almost a miracle that we should find others in the desolate lagoon. For the wind playing against the taut stays produced a high pitched, mournful whine which rose and fell with each gust. It was a lonely hum, a dreary message full of shipwreck and the inhospitality of the sea. It was a guardian voice of an area foreign to man—where the elements do not cater to his favor, but reserve this desert land for sea birds to build their nests upon,

and this water for whales to calve and feed bountifully in the protected shallows of the lagoons.

The *Seven Seas* began to careen on the outgoing tide and a *pongo* scraped alongside.

It was a crude flat-bottomed, double-ended craft, propelled by three boys with long sweeps, and a man at the stern with a paddle and an infectious grin. His features were kind, almost classic. The back was out of his old coat, and his underwear showed through rents in the seat of his trousers. His name was Carlos Preciado, leader of the group.

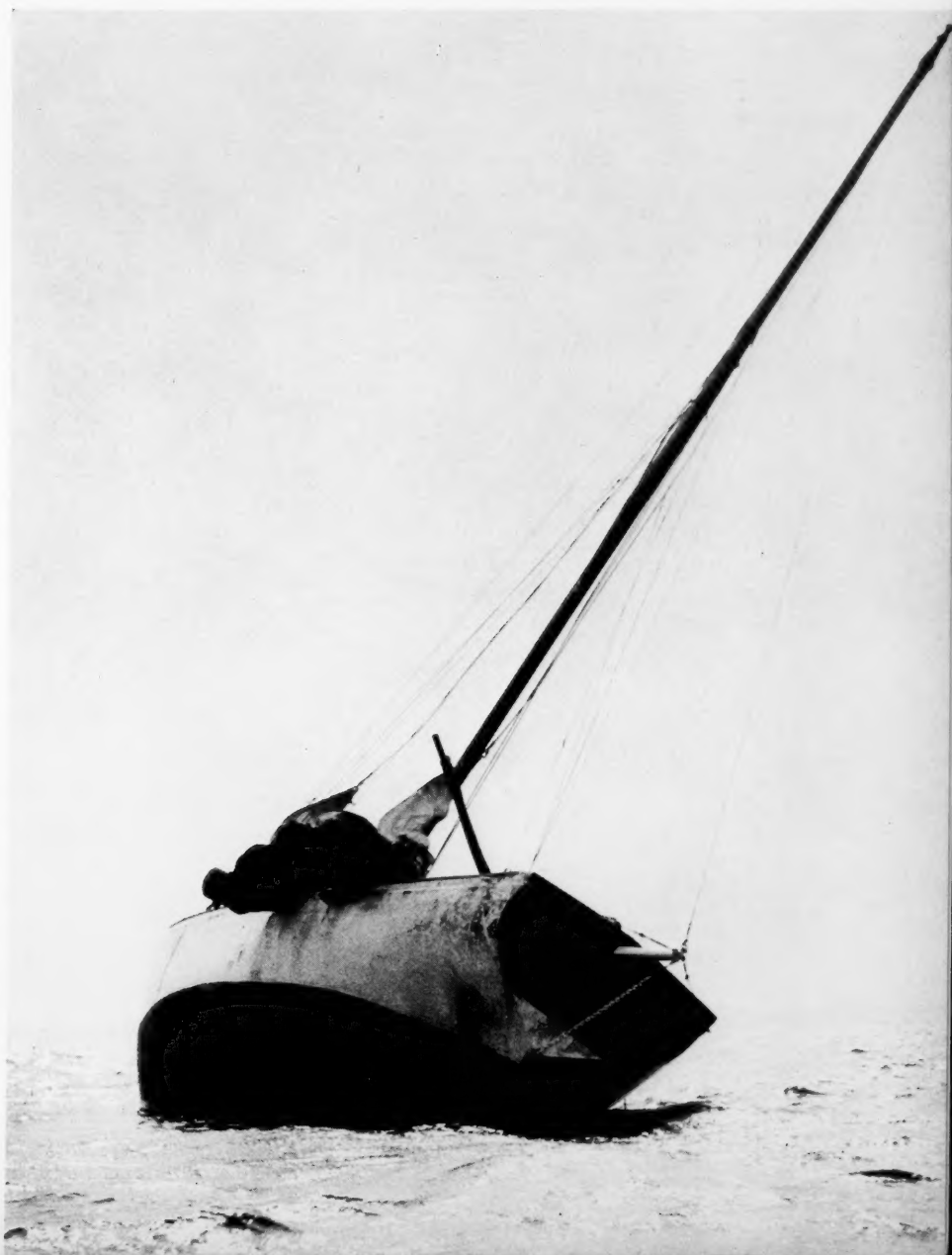
The Mexicans spoke no English, and our Spanish was confined to a few salutary greetings salted away in the backs of our heads long ago in school. Despite the language barrier, Carlos quickly

grasped the situation. After two of the boys had jumped into the water as if it were a lark and pushed on the bow without result, the Mexicans rigged one of their sweeps to the low side of the sloop on her beam, made it fast to a gunwale, and in this way produced a support to ease the sloop over on her side as the tide ran out.

Woody was below when he heard a strange voice speaking English. Coming on deck he found Karl in conversation with a fifth member of the party who had come out from the camp and was telling Karl in fluent English that they were hunting turtles; that the supply boat had not shown up for a month from the cannery at Ensenada; that he was adviser to the group; that he had worked in Alaskan canneries for twenty years; that he

*"Where did
all the water go?"
The Seven Seas
got tangled with the
bottom at a spot
where there wasn't
enough of the stuff
in uncharted
Scammon Lagoon.*

JANUARY-FEBRUARY 1950





*Rescue!
Mexican turtle hunters
rigged a heavy sweep
to ease the sloop over
as the tide ran out.*

*RIGHT: The Seven Seas is almost
high and dry in Scammon Lagoon.
She was refloated in the evening
on the incoming tide
with the prodigious and
volunteer help of the Mexicans
led by Carlos Preciado, who here
is leaning outboard from
the sloop.*

*BELOW: Carlos takes the tiller
of the Seven Seas.*



*The ranges of sand dunes
on the south side of Scammon
Lagoon are almost entirely
devoid of plant life.*

ters
ep
er

once ran a bar in Ketchikan; that he once ran a cannery in Magdalena Bay which was put out of business by the "revolution"; that he owned the boat we had seen anchored in Manuela Lagoon—left there when he ran out of gas; that he was a native of Los Angeles and his name was Pete.

Pedro Ruiz Pedrin was a heavy-set man with a ragged gray beard, and a ragged gray mustache which was pointed over his upper lip. He sported a battered seaman's cap on top of black wiry hair streaked with gray. He wore an old black wool and leather coat to cut the chill wind. Yet few elements would have subdued his breeze of conversation which covered many subjects from treasure on Cedro Island to the "dream cannery" he was going to build in Magdalena Bay.

Time passed. A few inches of water slapped about the keel. Scallops on the sand bottom occasionally flapped their shells, and the environment was green with strands of widgeon grass, *Ruppia maritima*, which is more commonly a brackish water plant in the United States. Here in Scammon, however, it was purely marine. The closest fresh water was perhaps 25 miles inland at the

Ojo de Liebre—a spring—which, translated literally, means "eye of the jack rabbit." It is by this name that the Mexicans also know Scammon Lagoon.

As the tide began to rise Pedro spoke to the boys, and two of them put out for their island camp in our punt, the *Pootwaddle*, in order to hoist a light to guide us into the anchorage by the island. One sat down in the bow which quickly dipped beneath the water. It was a tricky small boat, but Carlos only laughed. "Let them go, they'll learn," he said. As the last light faded in the west a lantern appeared above the faint outline of the shack.

It was pitch dark before the *Seven Seas* stirred in the sand. For two hours Carlos and his men had been pushing on the long sweeps, and the engine kept running steadily to prevent the sloop from working higher onto the flats as the tide swept in rapidly against her sides.

The Mexican's black form, silhouetted against a blacker sky, spoke in soft Spanish, "Poco, poco," to the boy on the bow tugging in on the anchor line. The sloop began to bump gently over the



DORYLINE DRAGNET—Army Ants in the Cameroons

NOT ONE AFRICAN TRAVELER or traveling naturalist, I think, fails to mention the army ants, the dreaded *Dorylus*. They turned him (or her) out of bed around 2 A.M., most probably, raiding the house, devouring pests and pets alike and even threatening the traveler himself if he were a little slow getting out of their way. Though I cannot brag of being nearly eaten alive by army ants, I did see their moving columns many times, several times daily on occasion. These ants are always a fascinating object of study and speculation, and here my interest was far less on the side of collecting than it usually is. I have yet to find that rarest of the rare, a fertile queen. But in Mabeta I had a good chance to watch a moving column of these ants for six days. I would have passed this column as I did many others had I not noticed white spots and streaks in the red ribbon of marching ants. Upon closer investigation these turned out to be the brood, larvae and pupae, of the Dorylinae; they so intrigued me that I kept them under observation morning, day, and evening, until they vanished altogether.

This was when I first saw it as a moving column—an ant colony changing its bivouac. It consisted of several streams crossing and criss-crossing, with the main “channel” nearly two inches wide. As the day advanced and the sun shone warmer the ants, following their usual practice, dug deep “tunnels” in the ground until most of the track was covered with the characteristic “roofing” of sand and traffic went on underground, sometimes in several tunnels one under another. Overhead, the big soldiers formed another roof,

raising their enormous heads armed with huge and extremely sharp mandibles. They were most alert to danger. When I brought a stick near they lifted their heads still higher and right toward it, even though they are entirely blind like the smaller workers. Within the column I noticed many immature workers or soldiers marked by the yellow coloration of the head, pallid and soft. These did not join in the protective roof unless I disturbed the ants seriously with a stick. Then, stimulated by what must have seemed great danger, the younger ones would take up positions beside the older and bite viciously when the stick or my finger came close.

The insects marched in constant streams, carrying their brood or sometimes fragments of unlucky prey under their bodies. They did this with great speed, seeming to be little hampered in movement by their loads. I tried to estimate the number of ants traveling through the main column—judging their speed by watch and then counting roughly the number that passed through five centimeters in ten seconds. I did that several times at different points of the main column, but even so results are naturally inconclusive. Within an hour the number that may have passed varied from 6,000 to 20,000, and to this one must add the troops in the lesser columns. The speed of a large soldier traveling in the column I estimated at 1.8 meters or roughly two yards per minute, and that of a medium or small worker at 1.2 meters. Large workers carried the larger loads, and those with loads moved slower than those without.

Traffic flowed throughout the morning, dying

bottom. The propeller ceased to thrash as the ship gained a little way. Pedro steered, the pongo being towed behind. Carlos continued to pole, first on one side then on the other. The light on shore grew dimmer; the sloop all of a sudden came free.

“La canal,” said our guide, and he took the tiller—then we struck again. The poling continued till we had slid over another bar and into another channel.

Now the light on shore was gone. We were enveloped in a black void. Every star was obscured by fog. Carlos again took the helm, and began to sound his way with a fishing line and sinker. The sloop came around and at a slow speed we pushed

through the black. To our relief a light on shore again cast a dim but friendly streak across the lagoon. The lead made an occasional *kerplunk* in the sea beside the sloop. Many minutes passed before we could head directly on to the light, as the shifting channel wandered in many directions through the lagoon. Carlos steered us in behind the western point of the island where he dropped anchor, after running in close to the beach.

Midnight was close when the pongo slipped away into the dark, and “Buenos noches” came back to us over the water, quiet now, for there no longer was any wind.

(To be concluded)



Male Dorylus ants, life size, from the forest near Victoria, British Cameroons, collected by the author. Specimens of workers and soldiers had not turned up in Malkin's material in time to be included.

out by noon to be resumed in late afternoon when the sun was down and heat less intense. I wanted to know what happened during those noon hours. Digging through the debris beyond the point where the column vanished I discovered large "depots" of the brood, with 500 to 2,000 pupae and larvae in each. As I disturbed them the adult ants ran madly to the surface. So during the noon hours the ants gathered in large groups for a rest-stop.

I had hoped to discover the main bivouac where presumably the queen would be present, but no luck. After four days the ants disappeared in a depression covered with matted grass and vegetation. The moving column I saw no more, but next day a raiding party appeared. Its presence was first revealed when roaches, crickets, and daddy-long-legs were flushed out of hiding and took to the vegetation to get off the ground. Since these creatures are nocturnal and usually spend the hours of light under logs, their appearance in broad day trying to climb plant stems immediately signified something unusual. Then the raiders came out into the open on the short meadow grass. Their victims' chances of escape didn't look very good—on occasion I've seen the ants as high as 12 feet above ground on the leaves of creepers.

There in the open meadow I could see the developing pattern of attack. The *Dorylus* developed into a fan-shaped force in depth, spreading out wider and wider. Its leading mass was composed of a wide sheet of swarming ants, its rear

Photograph by Frank L. Rogers

of several streams like the ribs of a fan. Over the advance party hovered slender yellow phorid flies. These are said to parasitize the Doryline ants, but just what their relationship with the ants was at this time I don't know. The flies kept to within a foot of the ants, frequently suspended in air, and then would strike with lightning speed towards them. But what seemed actually to have attracted the flies most was the host of crickets, roaches, and others running away from the assaulting ants. Sudden movements of these insects brought the phorids darting in their direction. I never observed the flies touching ants—perhaps their movement towards them was purely tropistic (tsetse flies, for example, are attracted toward moving vehicles, which must suggest game animals to them). With a light net I caught about thirty of the swooping flies.

Eventually the ants formed a fan at the front six meters wide and three meters deep. Thousands of them must have comprised the "task force." The whole raid lasted three hours from the time it broke out into the open area, and advanced about 20 meters. By 11 A.M. the surge slackened. A great majority of the ants reversed their direction—they were loaded with booty, chiefly caterpillars, worms, spiders, roaches, and other soft bodied insects, or I should say, their fragments. The victims were promptly dismembered and dissected into small pieces.

What I did not see on this or any other occasion was the males. The males of the Doryline ants are so unlike the workers or soldiers that for years those of some species had been placed in other genera, until they were definitely associated with the neuters. I have seen and collected a great many males at lights but never with the colony. The male is many times larger than the neuters, winged, with bulky body (hence common name "sausage-fly"), and has large, curved mandibles which in spite of their size are feeble and useless for offense.

The immediate and terrifying aspects of the Doryline raiding party aside, there are many interesting questions about these ants remaining to be answered, but I had no time now to take up the challenge. Pressed by the necessities of intensive museum collecting, I gave up efforts to locate the army after it disappeared completely on the seventh day. For several days afterwards I scanned the area casually but found nothing before I had to leave once more for Victoria.

SONS OF SCIENCE, *The Story of the Smithsonian Institution and its Leaders*. By Paul H. Oehsler. *The Life of Science Library*. Henry Schuman, New York. 1949. xvii + 220 pp., illus. \$4.00.

This interesting and important volume purports to be the story of the Smithsonian Institution and its leaders. The term "leaders" here denotes the administrative heads of Smithson's generous gift to our nation; it might be demurred that some of the real "leaders" (or leading men) were not only not administrators but were not possessed of those special faculties that make for business administration and, especially, for successful application to the Congress and the Executive for government funds to enlarge their departments or to extend the scope of their operations.

The Smithsonian offers us a very inspiring example of how deep and how far government aid to science can go when that aid is efficiently administered. These leaders of the Smithsonian were not only able executives but also men of genius in their special sciences; hence the story of Henry and Baird and Goode and Langley and Walcott and Abbott and Wetmore is the enthralling story of a series of men who were great in their day and age and sphere of scientific action. I think we can say of each of them that he was truly one of the finer spirits of the time, liberal, learned, progressive, and, in the best sense of the term, utilitarian.

I had the privilege of being secretary to one of these leaders, Charles D. Walcott, when he was a geologist in the U. S. Geological Survey under Major Powell. I think I never worked for a better boss than the future Secretary Walcott. When Major John W. Powell retired from the Geological Survey (because mainly of a difference of opinion with Senator Warren and other Far Western senators over the Federal policy on arid lands and related issues), Mr. Walcott and Mr. W J McGee, for both of whom I was acting as secretary at the time, drew lots as to my going or staying with one of them. McGee won, and so I went with him from the Survey to the Bureau of Ethnology, then established across the street from the Geological Survey head offices.

Mr. McGee, whom our author calls "no period" McGee (it should be, however, "no point" or "no full point" McGee, to be technical), because the real working head of the Bureau (whose name he had changed from Bureau of Ethnology to the more specific title Bureau of American Ethnology). Major Powell was so fully immersed in writing his philosophy that the actual administrative work was largely done by McGee and by Mr. F. W. Hodge, the Chief Clerk and Librarian. I acted for both Powell and McGee as a sort of literary reviser, especially in the matter of classical etymology.

My only item of depreciative criticism of Mr. Oehs-

ler's splendid work is that in his rather too brief account of the Bureau of American Ethnology he fails even to mention the names of such outstanding authorities in their special fields in ethnology or anthropology as Colonel Garrick Mallory, the author of basic works on Indian sign language, hieroglyphs, petroglyphs; John C. Pilling, in his day the international authority on Indian bibliography; James Owen Dorsey; the Mindeleff brothers; Mrs. Matilda Stevenson, whose various studies of Indian ceremonials, kachinas, etc., were quite important; and Miss Frances Densmore, who did so much in the way of recording and making known the native Indian music and musical folklore.

Sons of Science proves there is still a fine field for a similar popular story of the men (and women) who were *not* administrators in the Smithsonian but who did the really valuable work of research in their various special fields.

It is interesting to note how science under Federal grants and administration tends more and more to be free and unhampered by political ideology. A little story, untold for over 50 years and apparently unknown to the writer of *Sons of Science*, will illustrate that advance. In the mid-'90s the Smithsonian conducted a series of popular lectures every season. These addresses were delivered by specialists in their various fields and were aimed at entertaining and enlightening the general public. In the season of 1896 one of these lectures was by the (afterwards) very eminent Lester F. Ward. His subject was "The Physiological Basis of Mind." Another of these lectures was delivered by my chief, Professor W J McGee, and was entitled "The Earth the Home of Man." Both these lectures were included in the original annual report of the Secretary of the Smithsonian, according to long established custom. But before the final publication of the report at the Government Printing Office, Senator Hoar of Massachusetts, the leading scholar in the Senate, called the attention of the upper house of Congress to the fact that some of his constituents were complaining of the government's circulating such "dangerous innovations" as were supposed to be contained in these two lectures.

It should be noted that in the '80s and '90s there was a prevailing jibe at the government's publication of books about "birds with teeth." This obscurantist attack on science was occasioned by the celebrated pioneer Federal publications on the Odontornithes of America. In consequence of Senator Hoar's concern about the unorthodoxy of Ward's and McGee's lectures these two papers were omitted from Secretary Langley's official report, and consequently they appeared only in a small edition of "separates" which I had the privilege of distributing from a semi-private drawer in McGee's office. It seems safe to say that such a suppression of scientific "theories" would be im-

possible today—thanks, in great part, to the magnificent accomplishments in knowledge and the freedom of thought by the Sons of Science.

WILLIAM McDEVITT

San Francisco

THE SEA SHORE. By C. M. Yonge. Collins, London. 1949. 311 pp., 40 pls. in color, 32 half-tone plates, 87 figs. in text. 21 shillings.

The sea shore, defined by Professor Yonge as "the region between extreme high and extreme low spring tides," is a very small strip of the surface of the globe, but it has for biologists an importance out of all proportion to its area. It is the place where land and ocean meet, a belt of stress and strain, a zone inhabited by tough and durable organisms, a region in which the dwellers of the sea push up as far upon the land as they are able, and in which conversely hardy derivatives of terrestrial stocks (e.g., rice grass, eel grass, shore-birds, shrews, otters, professors) encroach upon the sea. It is an area of wave-beaten rocks and shifting sands and pounding surf, where the naturalist works in complete happiness with the clean, fresh smell of the sea in his nostrils and the taste of salt on his lips. It is a zone of life and action and color and drama; and Professor Yonge has succeeded in a truly remarkable degree in maintaining the color and

drama while describing, with impeccable scientific accuracy, the life and action.

After introductory chapters including "The Discovery of the Sea Shore" (historical), "The Inhabitants of the Shore," "The Background of the Sea," and "The Moulding and Nature of the Shore," Professor Yonge takes his readers on a tour of the shores, as direct and convincing as if you and he were walking side by side along the beach, and he were pointing out to you the things of which he writes. He deals with sea-weeds, rock pools, shore fishes, barnacles and molluscs of a rocky shore, the intimate fauna of weed and rock. He seems, whether literally or figuratively, to leave no stone unturned.

Then he branches out to tell of borers into rock and wood (on which he is a well-known authority), zonation on rocky shores, the economics of the seashore, and various other subjects equally interesting. The numerous illustrations, especially the photographs by D. P. Wilson, both in black and white and in color, are excellent and well reproduced.

It would be unfair to review a book like this without giving a sample of the author's pellucid and imaginative writing. Of many passages that might be selected, let us take what he says about the sand:

"Sand is a very beautiful medium. Every child realizes this from its first moment on the beach. But the

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wonder grows no less with the considered judgment of maturity. Sand is vastly more durable than the massive pebbles which are quickly ground down against one another by the constant pounding of the waves. Although pebbles vary greatly according to the nature of the rock of which they are composed, the durability of many of them is estimated at little more than a year. But a grain of sand must be of durable texture to have withstood transport without being further reduced to a particle of mud. Each grain is so small and with so little space between it and its fellows that water is held around it by capillary action. Hence no two grains touch one another and the sand is not ground to fine powder, even when powerful waves, coming in at a rate of some five every minute, pound with a force of hundreds of tons along a stretch of beach.

"Pebbles roll over each other and so would crush animals or plants that attempted to live among them; a pebble beach is the most barren region of the shore. But unless churned with exceptional force, as on the more exposed Atlantic beaches, the water-laden sand is a wonderful medium for living things. It gives protection when the tide is out and a secure substratum on which an animal may move or in which it may burrow when covered by the sea. . . . The enduring wet sands of the sea are protectors of the land and over their firm expanse the waves break with fruitless fury."

Had you ever thought about sand in quite that way before? Very possibly not. Well, throughout Professor Yonge's book you will find ideas and concepts, whether new or old, illumined in a similarly stimulating way.

It is true that this is a book about the seashores of the British Isles, particularly England and Scotland. But the author is a zoölogist who has worked in many diverse parts of the world, and when he writes a book about Britain's shores he is thinking also of other shores ten thousand miles away. Therefore he emphasizes principles of wide application, which makes his book good reading anywhere in the world. This is a work that no marine ecologist, indeed no lover of the seashore, can afford to be without.

ROBERT C. MILLER

California Academy of Sciences
San Francisco

AMERICAN SPIDERS. By Willis J. Gertsch. *The New Illustrated Naturalist* series. D. Van Nostrand Company, Inc., New York. 1949. xiii + 285 pp., 44 color plates, 67 half-tones. \$6.95.

This is the book for nature lovers, teachers, and others who wish to become acquainted with our sadly maligned friend the spider. It is written by one of the foremost authorities on spiders—Dr. Gertsch, who is

curator of spiders in the American Museum of Natural History, has devoted his life to studying them—and is profusely illustrated with beautiful color and black-and-white photographs. Although the book will be useful for identifying at least the major group to which a given spider belongs, the author has not become so involved with identification as to lose sight of the more important and interesting biological aspects of a study of spiders.

The chapter titles should indicate the wealth of information this book brings to its users: *Introducing Spiders, The Place of Spiders in Nature, The Life of the Spider, Silk Spinning and Handiwork, Courtship and Mating, The Evolution of Spiders, The Tarantulas, The Cribellate Spiders, The Aerial Web Spinners, The Hunting Spiders, Economic and Medical Importance, The North American Spider Fauna.* There are Glossary, Bibliography, and Index.

The author's style of writing is semi-popular, making the book one that can be read for pleasure or kept handy as a reference for answering the many questions that seem to pop up constantly in connection with spiders and their taxonomic allies.

EDWARD S. ROSS

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HOPI KACHINA DOLLS with a Key to Their Identification. By Harold S. Colton. The University of New Mexico, Albuquerque. 1949. xv + 144 pp., illus. \$7.50.

Many visitors to the Southwest have purchased the little figures called kachina dolls which Pueblo Indians, particularly the Hopi and the Zuñi, make to represent their supernatural beings. Anyone who collects these dolls seriously is interested in knowing what they are, how they are made, and what they represent. This book is for the collector and will very likely stimulate others to become collectors of these charming objects—they are actually made for the children, who believe in kachinas just as our children believe in Santa Claus. Through the dolls they learn the lore of their fathers.

Being concurrently professor of zoölogy in the University of Pennsylvania and director of the Museum of Northern Arizona, Harold S. Colton was uniquely fitted for the intricate task of preparing tables and keys for the identification of 250 different kachina dolls, the prime purpose of this handsome and authoritative book.

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D.G.K.

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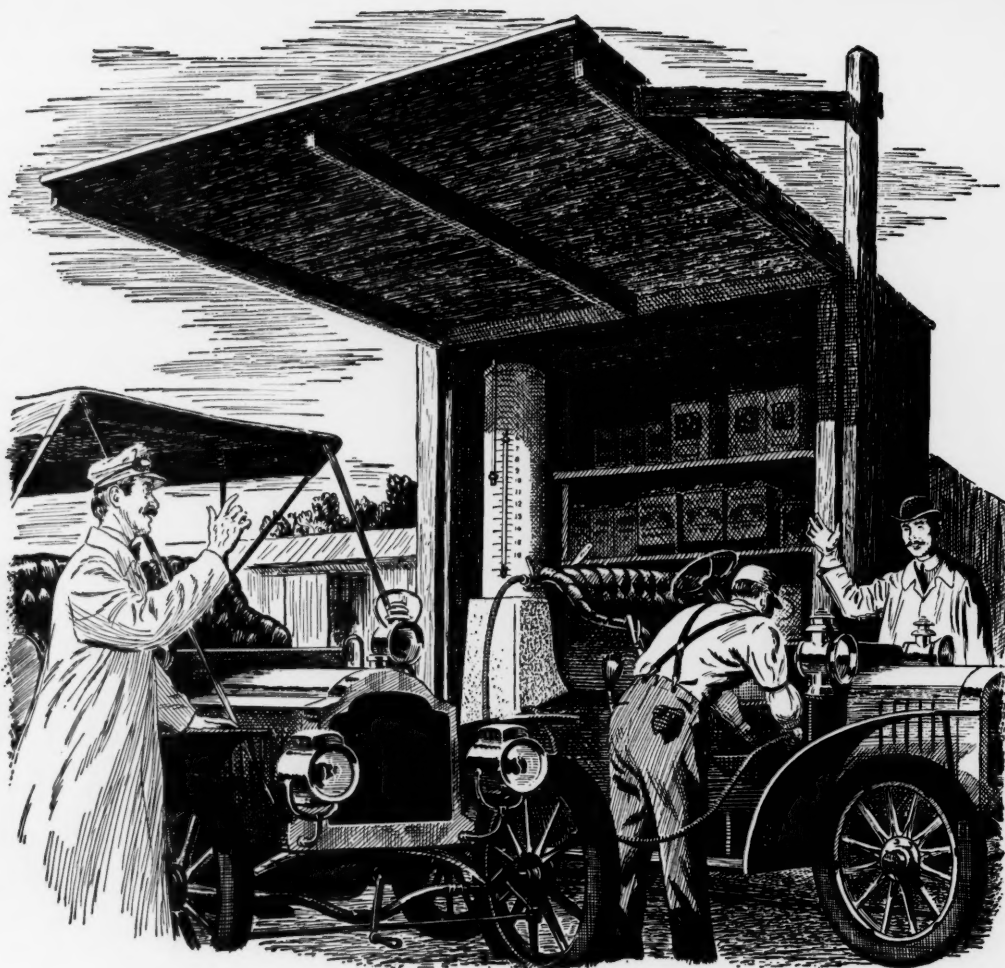
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